

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

4210 East 11th Avenue
Denver, Colorado 80220-3716
Phone (303) 320-8333

Telefax:
(303) 322-9076 (Main Building/Denver)
(303) 320-1529 (Plattman Place/Denver)
(303) 248-7198 (Grand Junction Regional Office)



Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

September 24, 1990

Attn: Robert A. Kilborn
Climax Molybdenum Co
Amax, Inc.
Climax, CO 80429

RECEIVED: ORIGINAL

SEP 28 1990

DWM-C PERMITS

RE: Analytical results of sample(s) collected from Point Source discharge
CPDS/NPDES Permit No. CO-0000248, 001, Lake County

Dear Mr. Kilborn:

On June 13, 1990, a representative of this Division obtained a sample of the discharge(s) from the above named treatment facilities. A copy of the analytical data of the sample(s) is enclosed.

If indicated, the following analyses were made in the field by our representative at the time of sample collection:

TEMPERATURE - pH - DISSOLVED OXYGEN - TOTAL RESIDUAL CHLORINE - OIL and GREASE (visual). All other analyses were performed in the Colorado Department of Health laboratory.

The WQCD maintains records of all analyses performed on the discharge from this facility; therefore, should you have questions regarding these or past samplings, please feel free to contact me at 331-4584.

Sincerely,

Stanley V. May
Eng. Phys./Sciences Tech. III
Field Support Section
Water Quality Control Division

Enclosures

xc: Local County Health Department
U. S. Environmental Protection Agency, Region VIII
Permits and Enforcement Section
District Engineer, Gary Soldano
Sampler, Bill Knieff

SVM/lc

0541m/1682m/1684m/0165m

WATER QUALITY DATA

RECEIVED: ORIGINAL

Water Lab No.

902948

Colorado Department of Health
Water Quality Control Division

SEP 28 1990

Bacti Lab No.

DISCHARGE SAMPLE

Rec'd By:

ER

Name of Sampling Location:

Max-Climax Molybdenum Co.

SC: Cφ-0000248

County:

Lake

Name of Sampler:

WH Knief

River Sample: Circle if Apply

Complete Incomplete Special

Date and Time Collected:

9006131120
Y Y M M D D Hrs. Min.

If Composite Sample:

Hrs. Min. To Hrs. Min.

Date Received in Water Lab:
9006141220
Y Y M M D D Hrs. Min.

Date Reported:

900914 AR
Y Y M M D DRemarks Settling Pondsgrab for all parameters
all samples taken @ outfall #001
@ the property line
split accepted by Debbie Diemer
Eng. Asst

Ten Mile Creek

P60 STREAM FLOW (cfs)

P1002 ARSENIC (ug/l)

P1067 NICKEL (ug/l)

P50050 DISCHARGE FLOW (mg/l)

P945 SULFATE (mg/l)

P1147 SELENIUM (ug/l)

P11 TEMPERATURE (F°)

46

P665 T-PHOS as P (mg/l)

P1077 SILVER (mg/l)

P400 pH (Standard Units)

7.78

P70507 ORTHO PHOS as P (mg/l)

P1092 ZINC (ug/l)

93

TR

P299 DO (mg/l)

8.8

P900 T-HARDNESS as CaCO₃
(mg/l)

P1034 T-CHROMIUM (ug/l)

P50060 TRC (mg/l)

P1012 BERYLLIUM (ug/l)

P1032 HEX. CHROMIUM (ug/l)

P410 T-ALK as CaCO₃ (mg/l)

P1027 CADMIUM (ug/l)

P22703 URANIUM-Natural (ug/l)

P556 O & G (mg/l)

K100 Uisua

P1022 BORON (ug/l)

P1501 GROSS ALPHA (pc/l) P1502

P31615 F-COLI. (per 100 ml)

P1042 COPPER (ug/l)

15

TR

P9503 GROSS BETA (pc/l) P9504

P310 BOD (mg/l)

P1045 IRON (ug/l)

420

TR

P3501 DIS. RAD.-226 (pc/l) P3502

P530 TSS (mg/l)

11

P1051 LEAD (ug/l)

P81366 DIS. RAD.-228 (pc/l) P81367

P70300 TDS (mg/l)

P1055 MANGANESE (ug/l)

650

TR

P610 AMMONIA as N (mg/l)

2 H

P95 COND (micromhos)

P71900 MERCURY (ug/l)

P625 TKN as N (mg/l)

P720 T-CYANIDE (mg/l)

0.01

P1062 MOLYBDENUM (ug/l)

P630 NITRITE/NITRATE as N
(mg/l)

u = less than

H = exceeded holding time

902948

Code: N COPS/NPDES: CP-000248 YR/MO/DAY: 90/06/13 INSP. TYPE: S INSPECTOR: S FAC. TYPE: 2

Rating: 3 BI: QA: CO: 33 River Basin: Colorado Seg:

Receiving Water: Ten Mile Creek Class: HQ1 2; R1 2; AL1C W; AL2C W; WS ; AG

DOES FACILITY MEET PERMIT REQUIREMENTS: Areas Evaluated - N Permit N Records N Site Review N Flow Mea.

N Lab Effluent/Rec. Waters N Pretreat. N Comp. Sched. N Self-Monitoring S O&M N Sludge Diso. N Other

Facility Name: Amax-Climax Molybdenum Co Permit Effective Date: 88/12/21

Location: discharge is located @ Ten Mile Creek + Colo Hwy 91 Permit Expire. Date: 93/09/30

Mailing Address: Climax, CO. 80429 Facil. Phone: 719-486-2150 ext 30

Operator in Charge: Frank Zaccanella Class. & #: Fac. Class: # of Operators: 2

Legal Contact: same Phone: same

Total Budget: \$ Salaries: \$ Utilities: \$ Maintenance: \$

Chemicals: \$ Sludge: \$ Other: \$ Cost/1,000 Gal: \$

Total Taps: N/A Industrial Taps: N/A Pop. Eq. Served: N/A Industrial PE: N/A

No. of Lift Stations: 0 I/I Program in Place: F I/I Problem (>120 gpcpd): F

DESIGN CAPACITY Hydraulic: N/A MGD Organic: N/A lb BOD/day

PRESENT LOADING Hydraulic: MGD Organic: lb BOD/day Capacity Used: H X O %

TRTMT. UNITS BS MBS Com Gr PC AS TF RBC SBR SC AnDig AerDig FiPr

DB UV C12 DeC12 Fi Coag PP Lag ALag LA Other: Sedimentation Ponds

Type, Capacity & Location of Flow Measuring Equipment: 40 foot parshall flume @ property line

Accurate: Date of Last Calibration: DHRs Correctly Completed: I Sampling per Permit: I

List Analyses Done on Site: pH On-Site Analyses by Approved Procedures: I

Contract Lab Name: Samples Properly Preserved: I All Discharge Points Permitted: I

RECORDS ON SITE I Permit I DHRs I Flow I Lab Sheets I Budget I O&M Manual I As Built P&S

Sludge Disposed and Sampled Properly: Meeting Compliance Schedule: Annual Report Submitted:

COM 1
COM 2
COM 3
COM 4

114 K1055

1111D

1111D

1111D

ENFORCEMENT MONITORING FACT SHEET

1. Name of Entity: Amax-Climax Molybdenum Co. 2. Permit #: CD-0000248
3. Date of Contact: 06-13-90 4. Time of Contact: 1110
5. Person contacted (name & title): Debbie Diemer Eng. Asst.
6. Phone No. where he can be reached: 719-486-2500 x300 7. Contacted by: WHR Knieff
8. Date of Scheduled Sampling: 06-13-90
9. Does Representative of Entity Wish to be Present? yes
10. If so, what is his name, title and phone number? See # 5+6
11. Do they wish to split samples? yes
12. If so, will they provide container? yes
13. What arrangements have been made to meet representative and/or gain entrance to the facilities: met with Debbie Diemer
14. Parameters to be monitored: BOD ☒ Suspended Solids ☒ D.O. ☒ pH ☒
Fecal Coliform ☒ Temperature ☒ Turbidity ☒ Chlorine Residual ☒
Oil & Grease VIS OTHERS (list): TCN- TRCu TRFe TRMn TRZn TNH₃-N
15. Type of sample (grab or composite, describe)? grab for all parameters
16. Special containers or preservatives? Metals with HNO₃, Nutrients with H₂SO₄, CN⁻ with NaOH
17. Persons present during sampling (names & titles):
Bill Knieff Eng Aide C
Debbie Diemer Eng Asst CDH Amax
18. Was sample split? yes
19. Who received or denied split (name & title)? See # 5
20. Disposition of sample after collection: Sample remained in my custody til delivery to State Health Dept. Lab on 06-13-90

Rec'd by Erica Robles 6-14-90 12:20pm

REMARKS:

Compliance for 001

Note: If laboratory analysis of the above mentioned sample indicates a violation of the "Water Quality Control Act," these results may be used, in the future, for enforcement actions.

Signature of sampler: WHR Knieff

COLORADO DEPARTMENT OF HEALTH
INORGANIC CHEMISTRY LABORATORY
4210 E 11TH AVE. DENVER, CO 80220
(303)331-4726

DATE: 08/20/90
REPORTED BY: BM

SAMPLE NUMBER: 902948
SAMPLE DESCRIPTION: AMAX-CLIMAX MOLYBDENUM CO

ADDRESS :

COUNTY: LKE
PHONE :

COLLECTED BY: WH KNIEFF
WHERE: OUTFALL#001
DATE SAMPLED: 06/13/90
DATE RECEIVED: 06/14/90
BOTTLES: 2LNEUT, LNUT, LCN, 500MET
TYPE: 4
COMMENTS: TOTAL RECOVERABLE

ANALYSIS RESULTS

AMMONIA	2 H	mg/L
COPPER	15	ug/L
CYANIDE, DIST	U 0.01	mg/L
IRON	420	ug/L
MANGANESE	650	ug/L
SOLIDS, SUS.	11	mg/L
ZINC	93	ug/L

U VALUES = LESS THAN

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

222 So. 6th St., Room 232
Grand Junction, Colorado 81501

Telefax:
(303) 322-9076 (Main Building/Denver)
(303) 320-1529 (Plattman Place/Denver)
(303) 248-7198 (Grand Junction Regional Office)



Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

September 12, 1990

RECEIVED
ORIGINAL COPY

SEP 13 1990

EPA REGION VIII
COMPLIANCE ENFORCEMENT SECTION

Frank Zancanella
Water Resources Manager
Climax Molybdenum Company
Climax Metals Company
Climax, Colorado 80429

Re: Annual Inspection, Industrial Discharge Permit Inspection,
Tenmile/Climax Mine and Mill, CDPS Permit No. CO-0000248,
Climax Molybdenum Company, Summit County

Dear Frank:

Enclosed is the Company's copy of the report for the inspection conducted on July 11, 1990. Thank you for your time and cooperation during the inspection.

Please contact me in the Steamboat Springs Office at (303) 879-7479, if you have any questions.

Sincerely,

Jim Chubril, P.E.
District Engineer
Water Quality Control Division

JC/ck

cc: Jim Rada, Summit County Environmental Health Division
Permits & Enforcement Section, CDH
Field Services, Denver
EPA, Region VIII
Sharon Ferdinandsen
Leslie Simpson (Inspection Report Only)
District Engineer
File

RECEIVED
SEP 14 1990

WATER QUALITY CONTROL
Director's Office

WASTEWATER TREATMENT FACILITY
INSPECTION REPORT

Code: N CDPS/NPDES: CO-0000248 YR/MO/DAY: 07/11/90 INSP. TYPE: C INSPECTOR: S FAC. TYPE: 2
Rating: 3 BI: N QA: Q CO: 59 RIVER BASIN: Colorado Seg: 13
Receiving Water: Tenmile Creek Class: HQ1 2 ; R1 2 X; AL1C W ; AL2C X W ; WS ; AG X
DOES FACILITY MEET PERMIT REQUIREMENTS: T Areas Evaluated: Permit S Records S Site Review S
Flow Mea. S Lab. N Effluent/Rec. Waters S Pretrtmt. N Comp. Sched. N Self-Monitoring S
O & M S Sludge Disp. N Other
Facility Name: Climax Molybdenum Co.-Climax Permit Effective Date: 12/17/88
Location: Climax, CO. Permit Expires Date: 09/30/93
Mailing Address: Climax Molybdenum Co., Climax, CO. 80429 Facil. Phone: (719)486-2150
Operator in Charge: Frank Zancanella Class & #: Fac. Class: # of Operators: 0
Legal Contact: Bob Kilborn Phone: (719)486-2150
Total Budget: \$ 0 Salaries: \$ 0 Utilities: \$ 0 Maintenance: \$ 0
Chemicals: \$ 0 Sludge: \$ 0 Other: \$ 0 Cost/1,000Gal.: 0.00
Total Taps: 0 Industrial Taps: 0 Pop. Eq. Served: 0 Industrial PE: 0
No. of Lift Stations: 0 I/I Program in Place: F I/I Problem (>120 gpcpd): F
DESIGN CAPACITY Hydraulic: 0.000MGD Organic: 0lb BOD/day Capacity Used: Hyd 0%
PRESENT LOADING Hydraulic: 0.000MGD Organic: 0lb BOD/day Org 0%
TRTMT. UNITS: BS MBS Com Gr PC AS TF RBC SBR SC AnDig AerDig FiPr
DB UV Cl2 DeCl2 Fi Coag PP Lag ALag LA Other
Type, Capacity & Location of Flow Measuring Equipment:
Accurate: F Date of Last Calibration: / / DMRs Correctly Completed: F Sampling per Permit: F
List Analysis Done on Site: On-Site Analysis by Approved Procedures: F
Contract Lab Name: Samples Properly Preserved: F Disch Points Permitted: F
RECORDS ON SITE Permit DMRs Flow Lab Sheets Budget O&M Manual As Built P&S
Sludge Disposed and Sampled Properly: F Meeting Compliance Schedule: F Annual Report Submitted: F
Inspector Name Jim Chubrilto Initials J/C Title District Engineer Phone (303)879-7479

INDUSTRIAL DISCHARGE PERMIT INSPECTION
PART II

Page 2.

1. Legally Responsible Party Climax Molybdenum Company
Mailing Address Climax Molybdenum Company, Climax Metals Company
City Climax State CO Zip 80429
Business Phone 719-486-2150 (Climax)
Emergency Phone 303-234-9020 (Garden)

2. Operating company Same
Mailing Address _____
City _____ State _____ Zip _____
Business Phone _____
Emergency Phone _____

3. County in which facility is located Lake, Summit, Eagle

4. Plant Products Molybdenum
Present Production Rate 6,000 tons/day Design Production Rate 30,000
Raw Materials Molybdenite ore

5. Briefly describe the process steps used in producing the product. Include a process flow diagram and a discussion of chemicals used at the site and their final disposition. State the final disposal of all wastewater streams. After mining the ore, the process involves successively crushing the ore. The process continues with grinding and flotation to further concentrate the molybdenum. The product is dried, packaged and shipped. All water used in the process is returned to the tailings pond system where it is treated with lime for metals precipitation. See attached flow sheets from Climax for further discussion of process and chemicals used.

6. What containment does the permittee have for materials used, processed or stored on site? The permittee has a SPCC Plan. Most all petroleum products are stored in surface steel tanks many of which have secondary containment structures. Process reagents are located within the Mill Complex. Permittee is replacing PCB's in transformers. Generally, all spills are to be contained at the source, and most contained within the Climax Water/Tailing System.
Are additional controls necessary? None noted at this time, except for Plan update.

Is the Materials Containment Plan adequate? Yes. Permittee will be updating plan.

7. Describe the wastewater treatment processes: Lime is added to process wastewater flow in tailings line to tailings pond system. Metals are precipitated in tailings ponds.

8. Evaluate the treatment facility. Include in this evaluation a discussion of any operation and maintenance problems: Treatment in the tailings ponds appears to be successful. Proper routing of flows within the system is essential. No major O&M problems noted. Permittee is working to improve pH adjustment facilities for effluent.

9. How are solid wastes disposed? Tailings are sent to tailings ponds.

10. How are hazardous wastes disposed? N/A

11. Are the facility conditions properly reflected by the permit? Yes (X)
No () If no, identify the differences:

Is there a need for extra permit conditions? None noted at this time, although possible need to address treatment/disposal of domestic sewage was discussed. The domestic sewage will need to be treated to secondary standards prior to discharge to tailings ponds.

12. Describe the physical condition of each discharge point. Is it discharging? If so, at what flow? Discharge 001 is discharging at about 9,000 gpm.

13. Is the permittee maintaining records as required in the permit? Yes.

14. Evaluate the potential for groundwater impact: Potential exists for a
facility operation of this type with tailings ponds. Groundwater
monitoring wells are being sampled and results reported
to WQCD.

15. Additional Comments: None at this time.

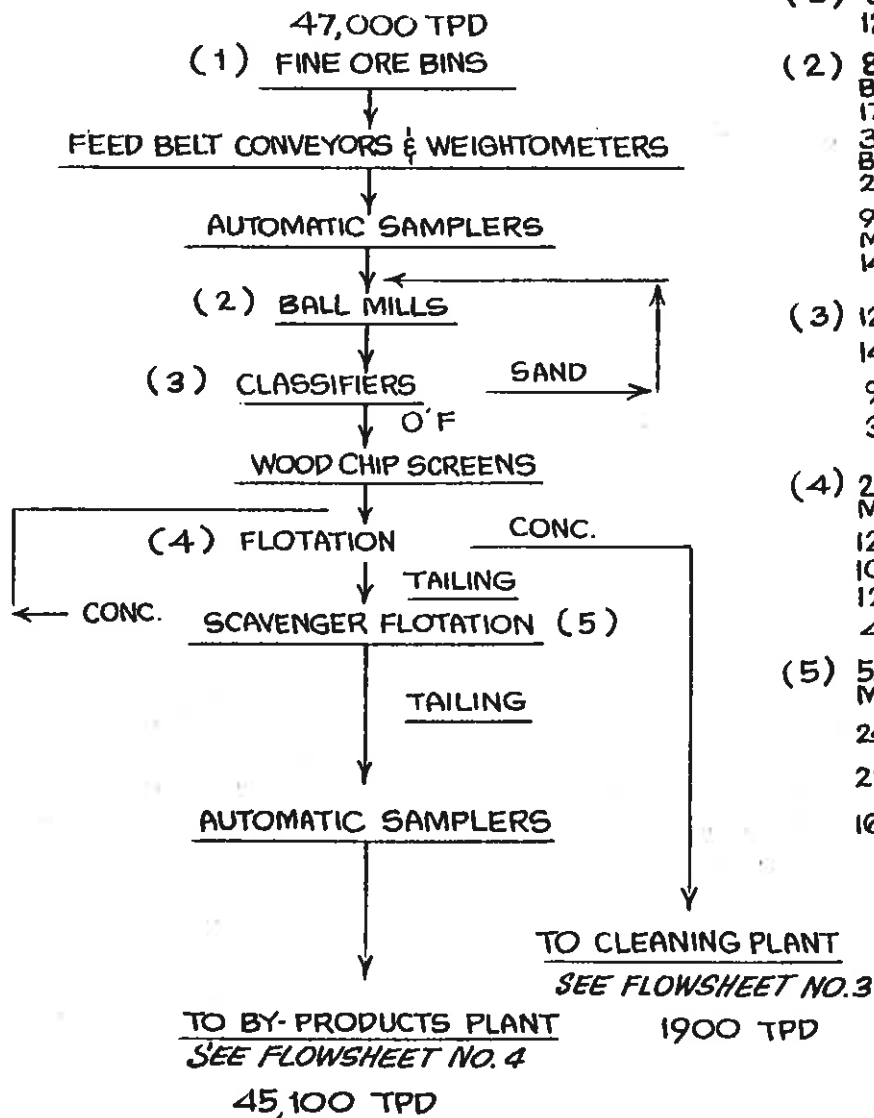
Include a site sketch of the facility and treatment system. If the permit has an accurate and detailed sketch, simply refer to the permit.

SKETCH

Refer to permit.

FLOW SHEET NO. 2

MAJOR EQUIPMENT



- (1) 8 - ORE BINS 35' x 35'
12 - ORE BINS 40' x 60'
- (2) 8 - 9' x 8' MARCY GRATE DISCHARGE BALL MILLS, 450 HP, DOUBLE SCOOP, 17 RPM
3 - 9' x 9' MARCY GRATE DISCHARGE BALL MILLS, 600 HP, DOUBLE SCOOP, 20 RPM
9 - 13' x 12' AC & MARCY OF BALL MILLS, 1,000 HP, DOUBLE SCOOP, 14.5 RPM
- (3) 12 - 66" AKINS CLASSIFIERS
14 - 78" " "
9 - D26 KREBS CYCLONES
3 - D20 KREBS CYCLONES
- (4) 286 - 36" WEINIG FLOTATION MACHINES, 290 RPM, 5HP / CELL
12 - DECO NO. 24 SUB "A"
10 - NO. 48 AGITAIR
12 - DECO NO. 300
4 - WEMCO NO. 300
- (5) 555 - 36" WEINIG FLOTATION MACHINES, 290 RPM, 5HP / CELL
24 - DECO NO. 24 SUB "A"
22 - NO. 48 AGITAIR
16 - WEMCO NO. 300

REAGENTS:

Primary Concentration - based on total rougher plant feed.

<u>Reagent</u>	<u>Usage Lb./Ton</u>	<u>Purpose</u>	<u>Addition Points</u>
Pine Oil	0.040	Primary Frother	Ball Mill Feed
Vapor Oil	0.70	Primary Collector	75% Ball Mill Feed 25% Flotation
Syntex	0.060	Surfactant and has frothing charac- teristics	75% Ball Mill Feed 25% Flotation
Lime	0.74	pH Regulation	Ball Mill Feed
Sodium Silicate	0.60	Slime Dispersant	Ball Mill Feed
Nokes Reagent	0.03	Lead Depressant	Ball Mill Feed

AUTOMATION CONTROL:

Direct digital control is being applied to operate primary grinding. The concept consists of an operations oriented computer with supervisory programs to direct the process. The system is flexible in that grinding and flotation control can be accomplished through the computer, by manual analog control in a central control room, or, in the plant by visual observations.

The desired objective of automation was achieved by developing three loops to control the overall circuit. The three loops are particle size control, tonnage control, and mill density control.

CLEANER CONCENTRATION:

Cleaner concentration is accomplished with three stages of grinding in closed circuit and five stages of flotation. Final concentrate grade is over 90% MoS_2 with cleaner plant recovery of 98%.

FLOW SHEET NO. 3

1900 TPD

ROUGHER CONCENTRATE

AUTOMATIC SAMPLER

FEED CYCLONES (1)

PUMPS

FIRST STAGE CYCLONES (3)

FIRST STAGE GRINDING (4)

CYCLONES (7)

SECOND STAGE GRINDING (8)

CYCLONES (11)

THIRD STAGE GRINDING (12)

CONDITIONERS (14)

FOURTH STAGE FLOTATION (15)

CONDITIONERS (14)

FIFTH STAGE FLOTATION (16)

DRYING & PACKING PLANTS

MAJOR EQUIPMENT

- (1) 4 - 24" CYCLONES
- (2) 2 - 125' THICKENERS
1 - 175' "
- (3) 8 - D15B KREBS CYCLONES
- (4) 3 - 6'8" x 20' MARCY GRATE
DISCHARGE PEBBLE MILLS,
25 RPM - 200 HP
1 - 8' x 20' MARCY
22 RPM - 200 HP
- (5) 24 - 36" WEINIG FLOTATION CELLS
21" IMPELLERS, 290 RPM, 5 HP/CELL
- (6) 48 - 36" WEINIG FLOTAT. CELLS,
21" IMPELLERS, 290 RPM, 5 HP/CELL
- (7) 6 - D10B KREBS CYCLONES
- (8) 2 - 8' x 20' MARCY GRATE
DISCHARGE PEBBLE MILLS
22 RPM, 200 HP
- (9) 9 - 36" WEINIG FLOTAT. CELLS,
21" IMPELLERS, 290 RPM, 5 HP/CELL
- (10) 48 - 36" WEINIG FLOTAT. CELLS,
21" IMPELS., 290 RPM, 5 HP/CELL
- (11) 6 - D10B KREBS CYCLONES
- (12) 2 - 8' x 20' MARCY GRATE
DISCHARGE PEBBLE MILLS
22 RPM, 200 HP
- (13) 8 - 36" WEINIG FLOTAT. CELLS
21" IMPELS., 290 RPM, 5 HP/CELL
- (14) 2 - 8' x 8' DEVEREAUX CONDITIONERS
875 RPM, 5 HP/ COND.
- (15) 7 - 36" WEINIG FLOTAT. CELLS
21" IMPELS., 290 RPM, 5 HP/CELL
- (16) 7 - 36" WEINIG FLOTAT. CELLS
21" IMPELS., 290 RPM, 5 HP/CELL

First Stage:

Rougher concentrate, averaging 1,900 tpd, is pumped to the cleaning plant and is ground in the first stage pebble mills. This grinding is accomplished with one 8' x 20' pebble mill and three 6'-8" x 20' pebble mills in closed circuit with cyclones. Grinding media is +2" flint pebbles. Media consumption in first stage grinding is 15 pounds per ton at first stage feed. White iron and rubber shell liners are used in these mills. Mill discharge density is held at 55% solids. Cyclone overflow is pumped to first stage flotation which consists of two parallel banks of 36 cu. ft. Weinig flotation machines. Retention time averages 15 minutes. First stage concentrate averaging 30% MoS_2 is advanced to second stage. Approximately 500 tpd of cleaner scavenger concentrate is returned, from thickener underflows, to first stage feed. First stage tailing is introduced to scavenger flotation with this concentrate reporting to middling thickeners and the tailing reporting directly to the tailing pond.

Second Stage:

First stage primary flotation concentrate is pumped to two 8' x 20' pebble mills in closed circuit with cyclones. Cyclone overflow is introduced into second stage cleaner flotation. Second stage concentrate averages 65% MoS_2 . Second stage flotation tailing is introduced to scavenger flotation with the scavenger concentrate reporting to the middling thickeners and the tailing reporting to the tailing pond. Second, third, fourth and fifth stage flotation are counter current with the concentrates being advanced from second through fifth stage and the tailing being returned, i.e., fourth stage tailing returned to third stage feed and third stage tailing returned to second stage feed.

Third Stage:

Second stage concentrate, averaging 65% MoS_2 , is pumped to two 8' x 20' pebble mills in closed circuit with cyclones. Cyclone overflow is introduced into third stage flotation feed. Third stage flotation concentrate averages 85% MoS_2 .

Fourth Stage:

The third stage concentrate is introduced to one conditioner tank and then to fourth stage flotation.

Fifth Stage:

The fourth stage concentrate is introduced to one conditioner tank and is then pumped to fifth stage flotation.

<u>Reagent</u>	<u>Usage Lb./Ton</u>	<u>Purpose</u>	<u>Addition Points</u>
Vapor Oil	0.90	Collector	Flotation
Sodium Cyanide	0.49	Pyrite and Chalco- pyrite Depression	Pebble Mills
Nokes Reagent	0.90	Lead Depression	Pebble Mills
Dowfroth 250	0.03	Frother	Flotation
Nalco 7873	0.006	Flocculant	Thickener Feed

Running Time - Re grind

	<u>% Operating Time</u>	<u>% Out of Ore</u>	<u>% Repair</u>	<u>% Misc.</u>
Cleaner Grinding & Flotation	98.0		1.5	0.5

FILTERING, DRYING AND PACKAGING:

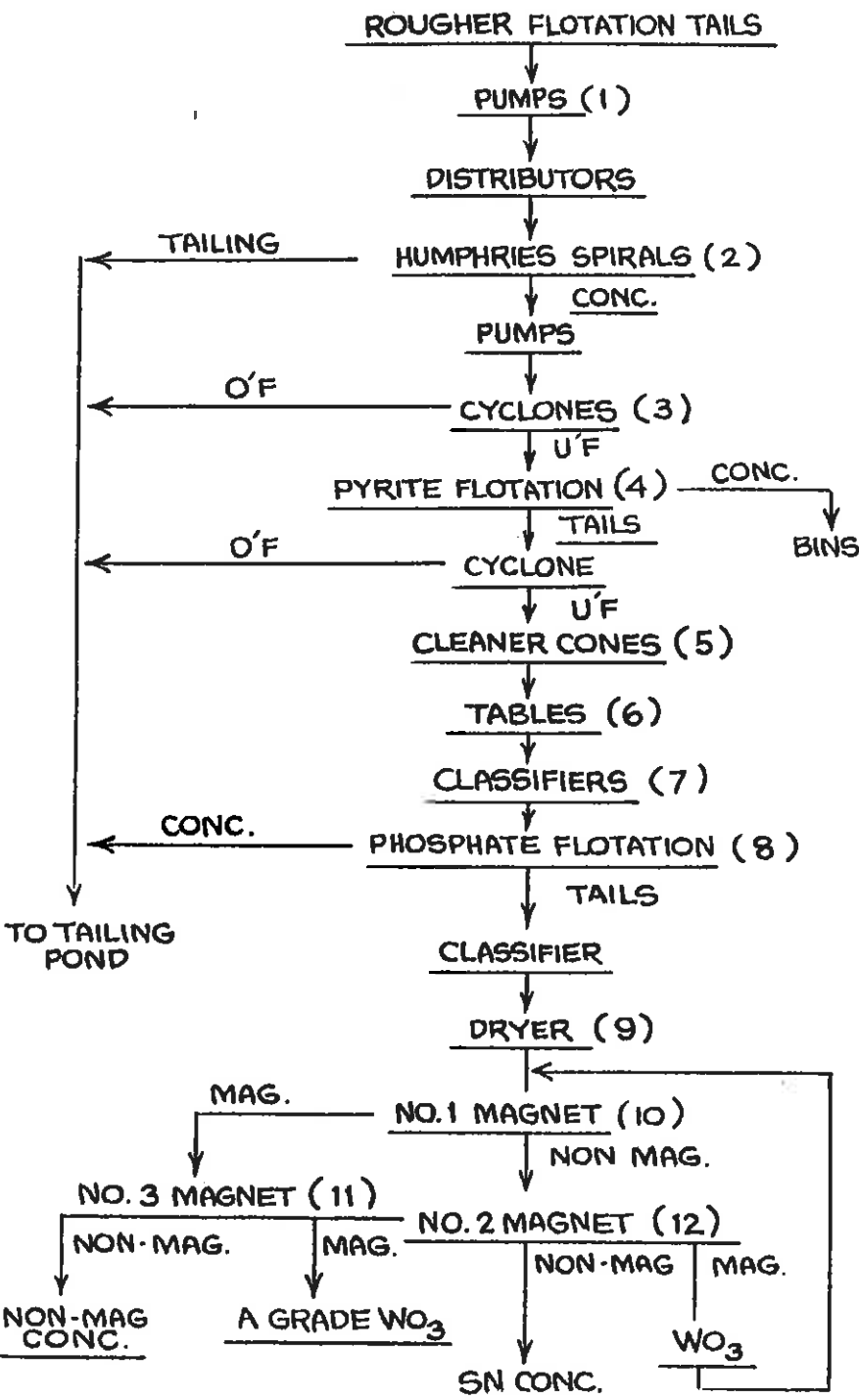
Fifth stage cleaner concentrate reports to thickeners. The thickener underflow is pumped to two Denver 6' leaf filters. Filter cake is conveyed by screw to a multiple screw Denver Holoflyte dryer. Dried product is screw conveyed to the packing area where the product is either packed in barrels or closed top hopper cars for shipment to consumers. Presently, most of the product is shipped to Climax reduction plants in Lang-
loth, Pennsylvania; Rotterdam, Holland and other foreign plants.

BY-PRODUCTS PLANT:

All rougher tailing is introduced to the by-products plant sump and is pumped and distributed to 836 Humphrey five-turn spirals. The spiral concentrate is pumped to cyclones for dewatering and the underflow fed directly to pyrite flotation. Spiral tailing is routed directly to the tailings pond. The pyrite concentrate is cleaned once with both rougher flotation tailing and cleaner flotation tailing distributed to three Reichert cone concentrators. The cone concentrate is advanced to twenty Deister tables. Pyrite concentrate averages 51% S and is sold to local markets. Table concentrate averaging 36% WO_3 is dewatered and introduced to phosphate flotation. The flotation tailing is dewatered, dried and sent to magnetic separators.

The magnetic separation circuit consists of three Dings cross belt magnetic separators in series. The first cross belt (No. 1 Dings) separator, with an average of 7.0 amps per pole, produces a wolframite magnetic product averaging 65% WO_3 . The second cross belt (No. 2 Dings)

FLOW SHEET NO. 4



MAJOR EQUIPMENT

- (1) 4 - D41-5 HYDROSEAL PUMPS
- (2) 836 - MODEL 24 A, 5 TURN HUMPHRIES SPIRALS
- (3) 4 - DIOD KREBS CYCLONES
- (4) 12 - 36" WEINIG FLOTATION MACHINES
- (5) 2 - 4DS REICHERT CONES
1 - 2DSSDS " "
- (6) 20 - NO.6 DIESTEN TABLES
- (7) 2 - 12" WEMCO CLASSIFIERS
- (8) 2 BANKS, 8 CELL EA. STEARNS FLOTATION MACHINES
- (9) 1 - ALLIS - CHALMERS STEAM DRYER
- (10) 1 - DINGS 18" CROSS BELT MAGNETIC SEPARATOR
8 POLES
- (11) 1 - 4 POLE DINGS CROSS BELT MAGNETIC SEPARATOR
- (12) 1 - 4 POLE DINGS CROSS BELT MAGNETIC SEPARATOR